

Abstract Submission for 20 min. Oral Presentation to:

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Abstract Title: Cryogenic Curation of Lunar Samples Returned to Earth

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Abstract:

Future lunar missions may collect samples that have been preserved at sub-freezing or even cryogenic temperatures. For such samples, the study of volatiles and temperature-sensitive minerals will have high priority. Valuable geochemical and mineralogical information will be lost if such samples are allowed to reach ambient temperatures on Earth. The ability to store, document, subdivide, and transport extraterrestrial geologic samples while maintaining sub-freezing or cryogenic temperatures, possibly as low as 40 K, is required for the complete scientific study of samples from cold environments. A lunar cryogenic sample return mission might require a combination of passive cooling during collection and cruise and active cooling during and after re-entry for maintaining desired temperatures. Once on Earth, cryocontainment must be maintained through delivery to a cryogenic chamber in the curatorial facility. This cryogenic curation chamber would include cameras and robotic manipulators for preliminary examination, subdivision of samples, and specialized sample allocation containers for shipment to laboratories world-wide. This presentation describes the planning and feasibility of cryogenic curation with current technologies developed for the superconductor industry. In addition, significant advanced research and development would be required to tailor some of these technologies to the task of sample return and long term curation of lunar samples at low temperatures in order to preserve their scientific integrity.